|  |
| --- |
| **Lesson Title:** VIVID VOLUME  Volume Measurement of Common Geometric Solids |
| Math 5th grade |
| **Introduction:**  In this lesson, the students will have a hands-on approach to connect how volume is used in our daily lives. This lesson will ensure that students can identify and differentiate prisms and pyramids with various polygons as their bases. The vocabulary of polygons has been reinforced by using graffiti boards and word walls. |
| **Lesson Length:** 60-90 minutes |
| **Materials:**  Allow students to work in small groups (3- 4 students). Each group needs:   * Set of clear geometric solids – including various prisms, pyramids, cylinders, & cones– with removable faces * Bag of dry rice per small group * Math Interactive Notebook * Paper and pencils |
| **Lesson Overview:** Students should begin this lesson by sorting the geometric solids into like (size/shape) categories (prisms and pyramids). Brief discussion should occur as to when students encounter these type shapes in real-life settings (e.g., buildings, cereal boxes, coke cans). Also, students can brainstorm various objects which we see and/or use every day demonstrating the concept of volume. Groups should record their data and then focus on two major comparisons that will form the major parts of the Lesson:  **Compare the Prism and the Pyramid**   * Have students select a prism and a pyramid which have the same size base and same height (This is a critical requirement for the two shapes; otherwise the students will be comparing “apples & oranges” and the volume relationship between the two shapes will not be visible). * Present the question: *How many pyramid cups of rice are needed to fill a prism exactly?* Have students pose various estimates. Briefly discuss. (Expect responses like 2, 2½, 3, …) * Demonstrate in front of the class the number of pyramids it takes to fill the prism. Be as exact as possible; fill the prism one pyramid cup at a time to the notched edge. It should take exactly 3 pyramid cups to fill the prism given the shapes have the same size base and same height. * Discuss with students the results. After all reach agreement, have them complete the sentence:   *It takes \_\_\_\_ pyramid cups to fill the prism.* Allow students to reflect on their estimations compared to the actual number, and record their data/conclusions.   * Shift to discuss the volume of the prism, V=*Bh*, where *B* = Area of the Base (either one of the parallel faces) and *h* = height (distance between the two bases). Note: some textbooks might state this volume formula as   V= *lwh*. If so, recognize that *B*=*lw*.  (Demonstrating the volume of the prism can be done in a variety of ways. Consider this example: use multi-link cubes and stack layers on top of each other creating a prism. See that volume is determined by multiplying the area of each layer (*lw*) by the number of layers in the stack (*h*).)   * Given the previous rice-filling demonstration, have students determine the volume of the pyramid, V=*Bh*.   That is, because it took 3 pyramids cups to completely fill the prism, the volume of the pyramid is then one-third that of the prism – again, given that the two shapes share the same size base and same height. |
| **Tennessee Standards:**    GLE 0506.4.1 – Use basic formulas and visualization to find the area of geometric figures.  GLE 0506.4.2 – Describe polyhedral solids and analyze their properties, including volume and surface area.  GLE 0506.5.1 – Make record, display and interpret data and graphs that include whole numbers, decimals, and fractions.  **MCS/Math Power Standards:**    Grade 5 - Find the area, volume and surface area of geometric figures including irregular shapes, prisms and  polyhedral solids. |
| **Lesson objective(s):**  TLW: Demonstrate appropriate understanding of vocabulary terms used to calculate volume.  Develop and apply content knowledge of how volume formulas are derived for common 3-D geometric shapes. |
| **ENGAGEMENT**  Activity:  Give each group a bag of popcorn and a different shaped box.  Prompt a discussion based on questions like: What can we do with this box mathematically? What shape is the box? How do you calculate the volume of the box? Etc.  **More Questions:**  1. What is the Volume of the box?  2. How is calculating volume used in real-life settings?  3. Why is understanding how to calculate volume important? |
| **EXPLORATION**    Big-Idea Questions include:  What are the formulas for calculating volume?  How is calculating volume used in real-life settings? (pools, beverages at a party..etc.)  Why is understanding how to calculate volume important? |
| **EXPLANATION**  Questions:  How is calculating volume used in real-life settings?  Why is understanding how to calculate volume important? (discuss cost of ordering too much or overfilling)  How would you explain the formulas to a classmate and/or family member? Assign this as part of their homework for that evening. Remember, students learn it when they teach it! |
| ELABORATION   * Brain pop video on volume   Additional Option:  Teacher may choose to share The Volume Video to reinforce/enhance students’ knowledge. See website for info: <http://www.havefunteaching.com/educational-videos/math/volume-video>   * Have students choose an object in classroom/at home which he/she will apply one of the formulas. * Reflect on all the different aspects of the formula and explain your findings to a classmate or your family.   **Vocabulary:**  polygons, volume, symbol, pi, rectangular prism, dimension, pyramid, prism, cone, cylinder, cubic units, capacity, compare, composite shape, calculate |
| EVALUATION  Exit Cards: write a brief summary on how understanding volume can impact their lives.   * Sample exercises * Teacher/student observations * On-going discussions * Students’ recorded data * Class participation |